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Explosive Safety Program, Policy and Procedures

Department of the Navy Risk  
Management Program for the  
Safe Manufacture, Storage and  
Handling of Ammunition and  
Explosives

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>AUG 1998</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-1998 to 00-00-1998</b>	
4. TITLE AND SUBTITLE <b>Department of the Navy Risk Management Program for the Safe Manufacture, Storage and Handling of Ammunition and Explosives</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Naval Ordnance Center, Farragut Hall, Bldg. D323, 23 Strauss Avenue, Indian Head, MD, 20640-5555</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADM001002. Proceedings of the Twenty-Eighth DoD Explosives Safety Seminar Held in Orlando, FL on 18-20 August 1998.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>32</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# Department of the Navy Risk Management Program for the Safe Manufacture, Storage and Handling of Ammunition and Explosives

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By  
Edward W. Kratovil  
Head, Weapons and Explosives Safety Office  
Naval Ordnance Center  
Farragut Hall, Bldg. D323  
23 Strauss Avenue  
Indian Head MD 20640-5555  
Phone DSN 354.6081 • Commercial 301.743.6081

Co-authors  
Richard T. Adams, NAVORDCEN  
Paul S. Wright, NAVORDCEN  
Thomas S. Heitzmann, NAVORDCEN  
Eric Alchowiak, CNO N411

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# **Department of the Navy Risk Management Program for the Safe Manufacture, Storage and Handling of Ammunition and Explosives**

**T**he Department of the Navy (DON) has established a comprehensive Explosives Safety Risk Management Program. The purpose of this paper is to describe the Navy's risk management philosophy and the elements of this overall program.

The DON is comprised of two military services, the Navy and the Marine Corps. As used in this paper, the term DON, or Navy, includes both Navy and Marine Corps units and shore activities. The term Naval does not include Marine Corps personnel or facilities.

## **Risk Management Philosophy**

Figure 1 provides a basic risk management model that is used within the DON Explosives Safety Program. All of our mishap prevention efforts at the Headquarters level are focused on one of these three areas: reducing the probability of occurrence of an explosives mishap, reducing the consequences if a mishap occurs, and continuously informing our personnel with regard to what constitutes an acceptable risk.



Figure 1. Basic Risk Management Model

These are the three core areas that we attempt to have a positive influence on, through implementation of effective sub-programs, or elements, within the overall DON Explosives Safety Program.

There are many elements to the overall DON Explosives Safety Program. These elements, when viewed as parts of the overall program, form a comprehensive explosives safety risk management program and provide a mechanism for implementing continuous improvement throughout the DON. The overall DON Explosives Safety Program is divided into five major elements:

1. Documentation
2. Assessment

3. Facilities
4. Enforcement
5. Education

Following is a discussion of each element.

## **Documentation**

The Secretary of the Navy has directed both the Navy and Marine corps, in SECNAV instruction 5100.10G, titled Department of the Navy Policy for Safety, Mishap Prevention and Occupational Health Programs, to establish comprehensive safety programs within their respective services. SECNAV Instruction 8020.3C, titled Responsibilities for Issuance and Acquisition of Waivers and Exemptions from Department of Defense Explosives Safety Standards, further tasks Chief of Naval Operations (CNO) to act for the Secretary of the Navy, in validating the need for, and approving or disapproving, all Navy and Marine Corps waivers and exemptions to explosives safety criteria. CNO has delegated this waiver approval responsibility to CNO (N41), Director of Logistics Plans and Policy, a two-star Flag Officer.

To implement the SECNAV-directed explosives safety program, CNO issued Operations Navy Instruction (OPNAVINST) 8023.2C, titled Explosives Safety Program, Policy and Procedures. Similarly, the Marine Corps issued Marine Corps Order (MCO) 5100.29, which provides the Explosives Safety Program Policy and Procedures for the Marine Corps. Both the Navy and the Marine Corps Explosives Safety Programs are very similar in content and implementation. In fact, many aspects of the program are shared jointly by each service, such as the waiver and exemption approval process, the Explosives Safety Site Approval Process, Explosives Safety Inspection (ESI) process, and the Weapon System Explosives Safety Review Board (WSESRB) process. Each of these processes will be discussed in detail later in this paper.

OPNAVINST 8023.2C provides detailed policy and procedures for the implementation of a DON Explosives Safety Program. This instruction states that this policy document is only applicable to the Marine Corps, to the extent determined by the Commandant of the Marine

Corps. Marine Corps Order 8020.10 defines the Marine Corps' Explosives Safety Program and those aspects of the Navy's program that the Marine Corps will use and those aspects for which the Marine Corps will establish their own policy and procedures. As stated above, both the Navy's and Marine Corps' Explosives Safety Programs are nearly identical, with only a few service-unique differences and, therefore, are tantamount to one program, the DON Explosives Safety Program.

In addition to providing policy guidance, OPNAVINST 8023.2C also tasks the Commander, Naval Sea Systems Command (COMNAVSEASYSCOM), to serve as the Department of the Navy's Technical Authority for Explosives Safety and to issue appropriate instructions and publications as may be necessary to implement a comprehensive program. With the establishment of the Naval Ordnance Center (NAVORDCEN) on 1 October 1993, the NAVSEA Explosives Safety Office was transferred to NAVORDCEN, which is a tenant command on, and physically located at Naval Surface Warfare Center Division, Indian Head, MD. Concurrently, with the physical move of this office to NAVORDCEN, Commander, Naval Sea Systems Command, tasked NAVORDCEN, in NAVSEA Instruction 5450.72, to implement all of the explosives safety functions that had previously been assigned to NAVSEA. Figure 2 provides a chart of the organizations within the DON responsible for Explosives Safety Program policy and implementation. All of the functions currently assigned to COMNAVSEASYSCOM in OPNAVINST 8023.2C are now executed by the NAVORDCEN (N71) Explosives Safety Office. Table 1 lists the responsibilities contained in OPNAV Instruction 8023.2C that are now assigned to NAVORDCEN for implementation. Figure 3 provides an organizational chart for the NAVORDCEN (N71) Explosives Safety Office that is responsible for implementing the overall DON Explosives Safety Program.

One of the duties and responsibilities of NAVORDCEN (N71) is to update and maintain the explosives safety documents listed in Figure 4. This is accomplished by using criteria from existing DoD, Military, Industry, or North Atlantic Treaty Organization (NATO) Standards, or by developing new Navy unique criteria, and publishing those requirements in appropriate DON documents. This is not a complete listing of all DON explosives safety-related manuals and instructions, but it does contain the major policy and criteria documents. The primary document



for issuing explosives safety criteria to all Navy and Marine Corps shore activities is NAVSEA Ordnance Pamphlet No. 5 (OP 5), Ammunition and Explosives Ashore, Safety Regulations for Handling, Storing, Production, Renovation and Shipping. NAVSEA OP 4, Ammunition Afloat, is the basic document that provides explosives safety requirements for forces afloat. With regard to the risk management model, through the developmental implementation of technically accurate explosives safety criteria, we are focussing on reducing the probability of a mishap occurring and also reducing the consequences if a mishap should occur.

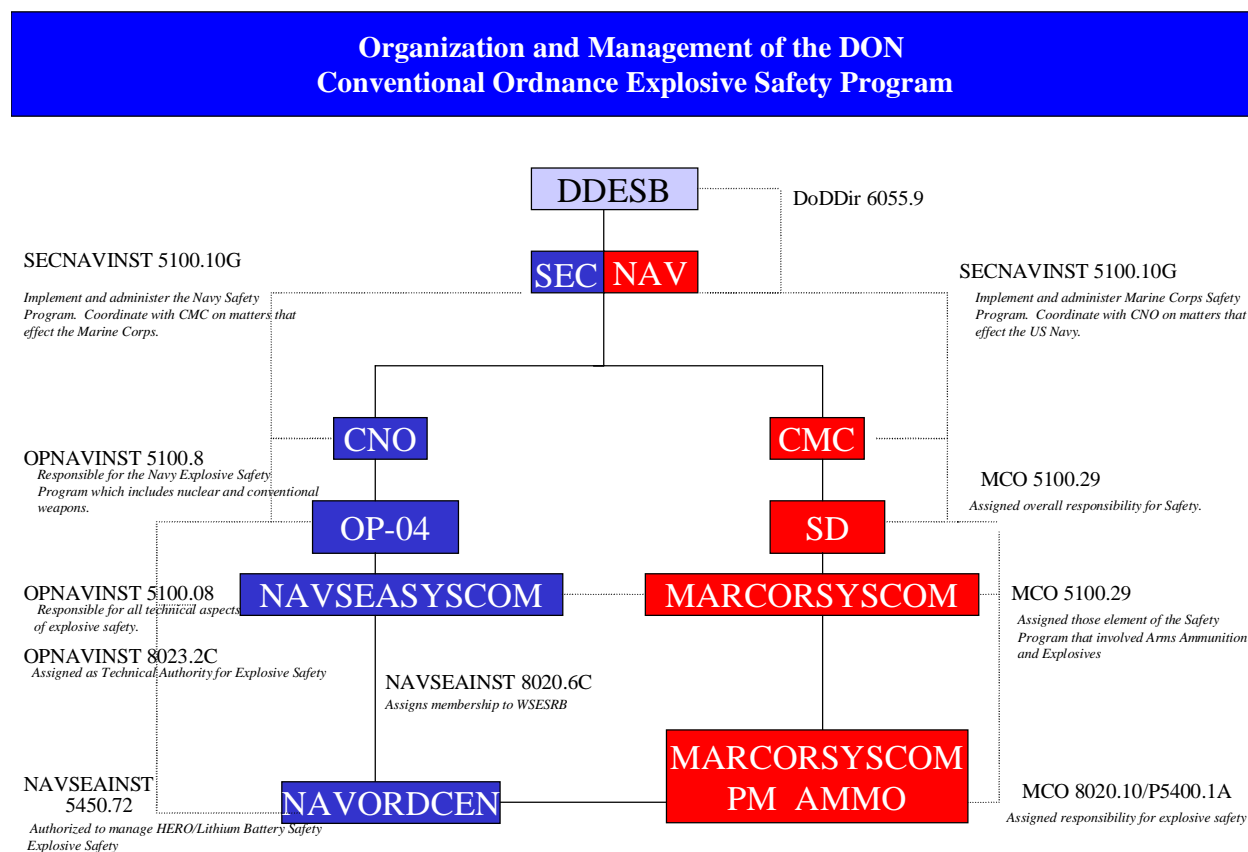


Figure 2. Organizations within the DON responsible for Explosives Safety Program Policy

DESIGNATED RESPONSIBILITIES ASSIGNED TO NAVORDCEN BY OPNAVINST 8023.2C
Provide DON point of contact for technical explosives safety matters involving Army, Air Force, Defense Logistics Agency, US Coast Guard, Foreign Services and other public and private agencies.
Coordinate explosives safety for USMC forces with the CMC and COMMARCORSYSCOM.
Provide technical assistance on explosives safety matters to all DON components.
Disseminate explosives safety standards and regulations.
Review and Coordinate site approval requests with CNO and DDESB.
Review and advise DCNO and CMC, as appropriate, on waivers and exemptions to explosives safety requirements.
Provide DON with criteria for explosives safety in research, operations, design, development, manufacture, transportation, employment, alteration, maintenance, storage, demilitarization, disposal.
Manage the WSESRB and the HERO programs and arrange for technical surveys to support these programs.
Conduct ESIs ashore and afloat.
Establish criteria for testing and certifying weapon handling equipment.
Receive, analyze, evaluate and compile reports of explosives mishaps.
Establish, monitor and evaluate USN training requirements involving explosives safety.
Participate in revision/update of the DoD Contractors Safety Manual.
Assign interim and final hazard classification.

Table 1. Designated Responsibilities Assigned to NAVORDCEN, N71, by OPNAV 8023.2C

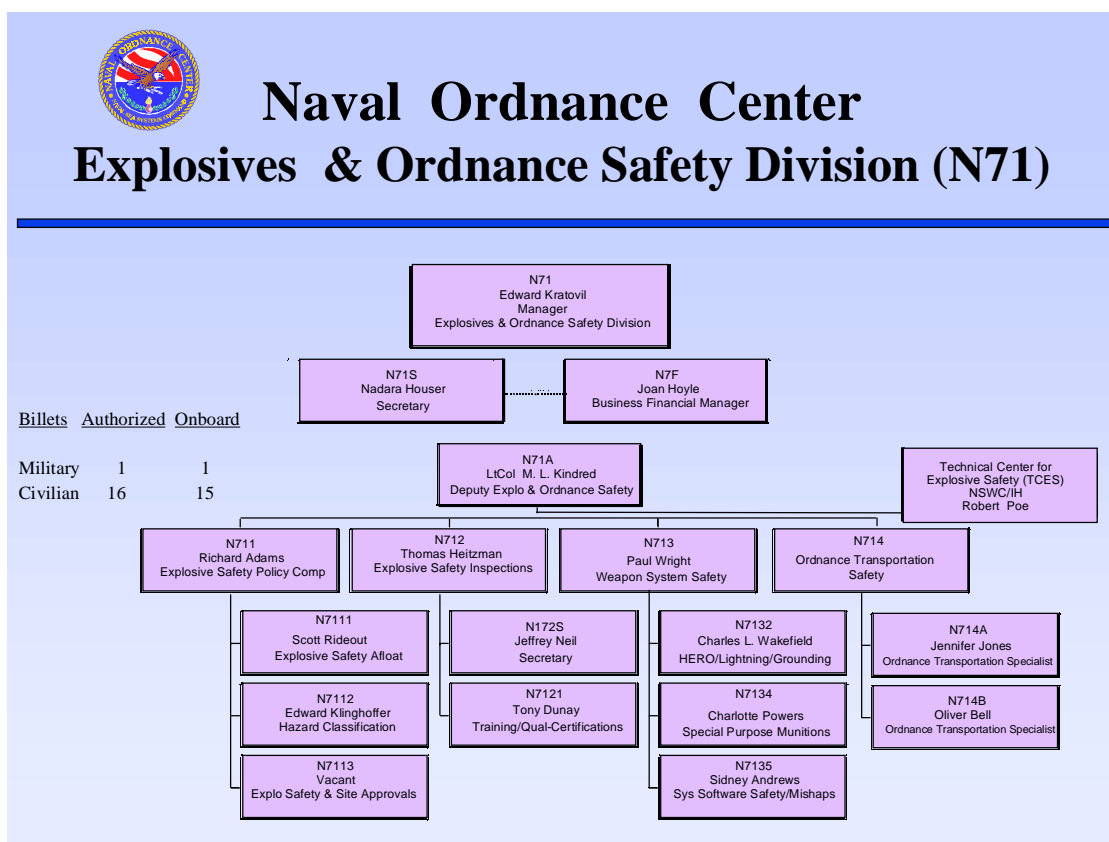


Figure 3. NAVORDCEN (N71) Organizational Chart

# Documentation

- NAVORDCEN implements DON Risk Management Program

## Standards

DOD Standard 6055.9

MIL-STDs

Industry Standards

NATO Standards

- NAVSEA OP-5 Explosives Safety Ashore
- NAVSEA OP-4 Explosives Safety Afloat
- NAVSEA OP-3565 HERO Manual
- NAVSEAINST 8020.6 WSESRB
- NAVSEAINST 8020.9 Personnel Qual/Cert
- OD 44942 Weapon System Safety
- NAVSEAINST 8023.11 SOP

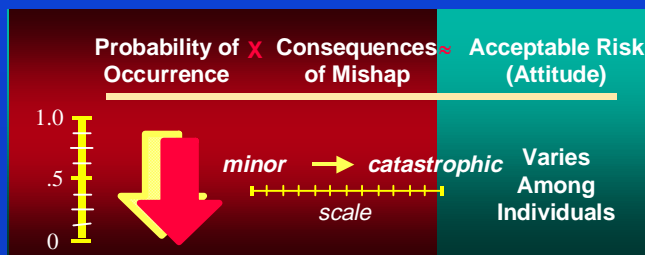


Figure 4. Explosives Safety Documentation maintained by NAVORDCEN (N71)

## Assessment

### Weapon System Explosives Safety Review Board (WSESRB)

The WSESRB is one of the primary components of the DON's explosives safety assessment effort. That is, the WSESRB process ensures that any new weapon acquisitions or product improvements receive independent safety reviews, including software safety evaluations, at key milestones within the acquisition process. The purpose of the WSESRB assessment is to ensure all weapons meet the DON explosives safety criteria throughout its lifecycle and that procedures are implemented, if necessary, to mitigate any residual risk.

Department of Defense (DoD) Instruction 5000.2R, titled Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information Systems Acquisition Program,

states that acquisition program managers shall identify and evaluate system safety and health hazards, define risk levels, and establish a program that manages the probability and severity of all hazards associated with development, use, and disposal of the system. This instruction also states that each management decision to accept the risks associated with an identified hazard shall be formally documented and that the residual risk must be formally accepted by the Program Manager, or by the Component Acquisition Executive (CAE), depending on the level of risk. For identified hazards evaluated as a serious risk, DoD instruction 5000.2R states that the Program Manager must sign appropriate documentation accepting the risk. For hazards evaluated as high risk, the CAE must sign the risk acceptance documentation. The CAE for the DON is the Assistant Secretary of the Navy for Research, Development and Acquisition.

Although the DON has had an on-going Explosives Safety Program since World War I, weapon design safety was primarily the responsibility of the acquisition official and the manufacturing organization, with little consideration given to formal weapon safety studies, analyses and testing. After a series of aircraft carrier fires in the mid-sixties, there was an initiative to further improve weapon safety. The WSESRB was established in 1968, as a result of a recommendation from the formal investigation panel of an explosives mishap aboard the USS FORRESTAL (CV-59) on 29 July 1967. This accident resulted when a 5-inch Zuni rocket on the flight deck of the FORRESTAL inadvertently launched and impacted other parked aircraft. The ensuing fire killed 134 sailors, injured 161 others, and produced \$72 million in damages.

The first official meeting of the Board took place 22 May 1968, to review the exploder for the MK 48 torpedo. Since this initial meeting, ordnance items reviewed have ranged from simple devices, such as detonators, to large, complex systems. Over time, the concerns of the Board have grown from simple explosives and fuze design safety to coverage of the entire life cycle of the system and its related fire control system, handling equipment, and embedded software. The Board normally holds formal reviews of approximately 55 systems per year, with many more “assists” by phone, letter or informal meetings.

The concern of the Board is to ensure that appropriate safety features are designed into weapons developed for the Fleet. The Board's charter specifically states that members must have no

responsibility for design, production and use of the system being reviewed. Though no one can forget that weapons are inherently dangerous and must function when required, the Board members must concentrate on the safety aspects of the ordnance item and depend on the acquisition program office to ensure operational performance requirements are met.

The WSESRB evaluates programs as early as possible in their acquisition cycle. In a perfect world and classic development program, there should be four WSESRB reviews. These would be performed at a time when the features of the weapon could be effectively and efficiently influenced. Reviews are typically performed early in research and development, before shipboard testing, and before technical and operational evaluations. Only after these reviews are successfully completed is limited production or full production authorized. For programs that skip or compress the classical milestones, the keys are “as early as possible” and “before shipboard testing”. All data to support the safety review are generated and provided by the program office.

The membership of the Board is composed of a Chairman and a Secretariat from the Naval Ordnance Center. There are also members from each SYSCOM, CNO and the Marine Corps. The Board is augmented with a large and varied group of specialists. The specialists come from activities that include: COMNAVSEASYS COM Insensitive Munitions Office, Explosives Ordnance Disposal (EOD) Technical Division, Naval Environmental Health Center, Naval Surface Warfare Center Division (NAVSURFWARCENDIV) Crane Demilitarization and Disposal Office, NAVSURFWARCENDIV Dahlgren Software Safety Office, and the Ordnance Environmental Support Office, NAVSURFWARCENDIV Indian Head.

The authority for the WSESRB comes from CNO instruction 8023.2C and is implemented in NAVSEA instruction 8020.6D, Navy Weapon System Safety Program. In accordance with DoD instruction 5000.2, the WSESRB does not have the authority, nor is it the Board's intent, to impede the normal progress of a weapon acquisition, but it can, and does, make safety recommendations to the program manager and to the Milestone Decision Authority (MDA). The implementing instruction states that "no weapon system program will proceed to shipboard or aircraft testing or to production approval without an appropriate WSESRB review." This review,

however, is intended not to be adversarial, but rather as an opportunity for the weapon acquisition program manager to obtain an independent safety assessment of the weapon system, including recommendations to ensure that the weapon system meets long-standing weapon system safety requirements. It is envisioned that the WSESRB and weapon acquisition program managers work in a cooperative effort to ensure that weapon system safety is maximized, while meeting the weapon's operational requirements.

The reviews are run efficiently and professionally. The agenda is strictly followed. A court reporter is present to make a transcript of the meeting and official minutes are issued. The presenter has 2 hours to address safety issues, which must include allowing time for questions from the Board members. The weapon system program office must request a Board review. The Board normally meets during the last week of the month. NAVSEA instruction 8020.6D provides detailed procedures on the conduct of a WSESRB review.

The other major areas of program assessment include the Ammunition and Hazardous Materials (AMHAZ) Handling Review Board (discussed in more detail later in this paper), Hazards of Electromagnetic Radiation to Ordnance (HERO) ship and shore surveys and weapon tests, hazard classification of ordnance items and lightning/grounding and electrostatic discharge (ESD) evaluations. The HERO surveys measure the electromagnetic environment generated by the emitters aboard, or near, a ship or shore activity. Weapon HERO tests determine the effects, if any, that the electromagnetic environment may have on the weapon. Similarly, lightning/grounding and ESD evaluations of individual weapons and explosives operating facilities provide information on the effectiveness of the weapon's or facilities' design to mitigate these phenomena.

## **Facilities**

### **Navy and Marine Corps Explosives Safety Site Approval Process**

The DON established a formal, centralized explosives safety site approval process in 1967. Prior to 1967, the DON had implemented a facility site approval process, but the process was less rigorous and required little documentation.

Referring to our risk model, the primary focus of the site approval process is on reducing the consequences of an explosive mishap, by ensuring that the required separation distances are maintained between the potential explosion site (PES) and all other facilities, and that the facilities' design meets current criteria.

The DoD explosives safety site approval process is predicated on the assumption that the probability of an explosives mishap is 1; that is, it is not a question of “if” a mishap will occur but rather “when” it will occur. Therefore, the site approval process ensures that no unnecessary personnel or unrelated facilities are located within the explosives safety quantity distance (ESQD) arc generated by the PES.

DoD 6055.9-Standard provides detailed guidance to all military services on explosives safety site approval requirements. Within the Navy, OPNAV Instruction 8020.8J, Responsibilities of Department of the Navy Commands with Respect to the Department of Defense Explosives Safety Board (DDESB), establishes policy on the submission of explosives safety site approval requests, and NAVSEA OP 5 provides detailed guidance on when site approval requests need to be submitted. Naval Facilities Engineering Command (NAVFAC) instruction 11010.44E provides the format for submitting site approval requests. For the Marine Corps, MCO 8020.10 requires Marine Corps activities to submit site approval requests per NAVSEA OP 5 and NAVFAC instruction 11010.44E.

Within the Navy, explosives safety site approval requests are required for the following situations:

1. For any new construction, when the facility will be used for ammunition or explosives manufacturing, maintenance, testing, storage or handling.

2. When the proposed new facility is within, or in proximity to, an inhabited building distance (IBD) ESQD arc from another explosives operating facility.
3. When the mission of an existing explosives operating facility changes.
4. When there is a need to increase the explosive limit on an existing explosives operating facility.
5. When a facility is no longer used for explosives operations and the existing ESQD arc needs to be disestablished.
6. When an ordnance facility is modified.
7. When a facility located within an existing ESQD arc is modified.
8. When a facility is under an existing waiver or exemption.
9. When maintenance or repair (other than routine maintenance) is performed on a facility, and the facility is located within the K18 separation distance from a potential explosion site.

Within the DON, NAVORDCEN, per DoD 6055.9-STD, can approve certain explosives safety site approval requests. The requests that can be approved at the NAVORDCEN level are those that do not introduce additional hazards or do not increase the net explosives capacity for which the facility was originally designed and site approved by the DDESB. The NAVORDCEN currently processes 350-400 site approval requests per year, with approximately 150 requiring approval by the DDESB.

The process for submitting a site approval request begins with the local shore activity where the explosives operation is to be performed. The activity submits the site request to the NAVFAC Engineering Field Division for their respective geographic area. NAVFAC has established eight Engineering Field Divisions/Activities (EFD/EFA), to provide facilities construction and maintenance support to Navy activities within their geographic area of responsibility. NAVFAC Northern Division, Philadelphia, PA, covers the Northeastern and mid-western U.S, including Navy activities within Pennsylvania, Ohio, Indiana and Illinois; Chesapeake Division covers Navy activities within the Washington, DC area; Atlantic Division, Norfolk, VA, includes Puerto Rico, and the Mediterranean and Persian Gulf areas; Southern Division, Charleston, SC, includes the southeastern U.S., including Texas; Pacific Northwest Activity, Silverdale, WA, includes the



states of Idaho and Oregon; Western Division, San Bruno, CA, includes Northern California, Nevada and Utah; Southwest Division, San Diego, CA, includes southern California, Arizona and New Mexico; and Pacific Division, Pearl Harbor, HI, which includes all Navy activities in Hawaii and the western Pacific.

After the EFD or EFA review, the request is submitted to NAVORDCEN for a detailed technical review. If the request cannot be approved at the NAVORDCEN level, the request is forwarded to the DDESB for final approval. DDESB decisions are returned to the NAVORDCEN, for subsequent return to the EFD/EFA and to the requesting activity. Copies of all site approval requests are provided to the Explosives Safety Support Offices (ESSO), Atlantic and Pacific. These offices conduct inspections of all Navy and Marine Corps shore activities; therefore, it is important for these inspectors to be aware of all planned construction or modifications of ordnance operating facilities. The role of the ESSOs in the inspection process is discussed in the next section. The ESSO offices also have limited approval authority for certain site approval requests. If the site request involves 300 pounds or less of class/division 1.3, 1.4 or 1.2 (04) material, the ESSO Atlantic or Pacific can approve these requests. Figure 5 provides a diagram of the approval process within the Navy.

For Marine Corps activities, the process is very similar, except the EFDs/EFAs do not provide facilities support to the Marine Corps. The Commandant of the Marine Corps (CMC) has established an explosives safety office within the Marine Corps Systems Command (MARCORSYSCOM (AM-EES)) and a facilities planning and support group within the CMC headquarters; their code is CMC (LFL). Marine Corps activities submit their site approval requests to MARCORSYSCOM (AM-EES), then to CMC (LFL), with the remainder of the process identical to the Navy process previously described. Figure 6 provides a diagram of the approval process for Marine Corps activities.

The DON has established an effective, centralized explosives site approval process, integrated with the NAVFAC general facilities planning process, that has been accepted by the DDESB, and that provides detailed technical reviews to ensure compliance with explosives safety design criteria, all at minimal cost.

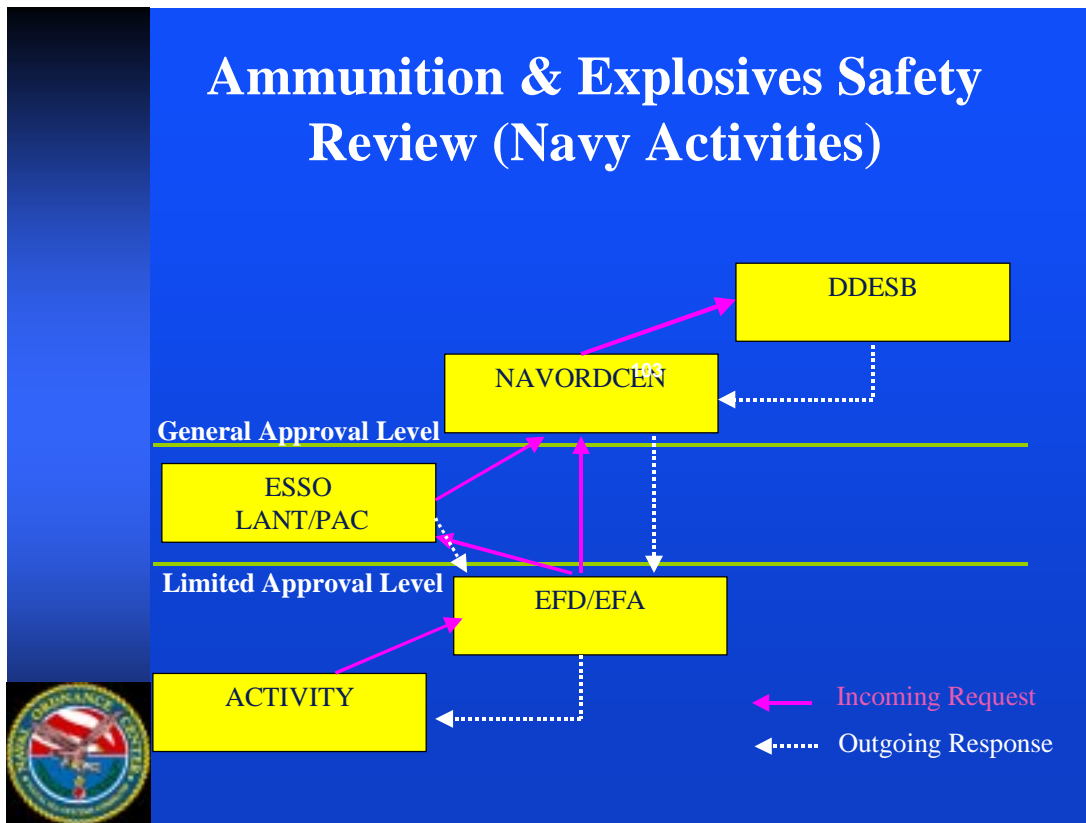


Figure 5. Navy Site Approval Process

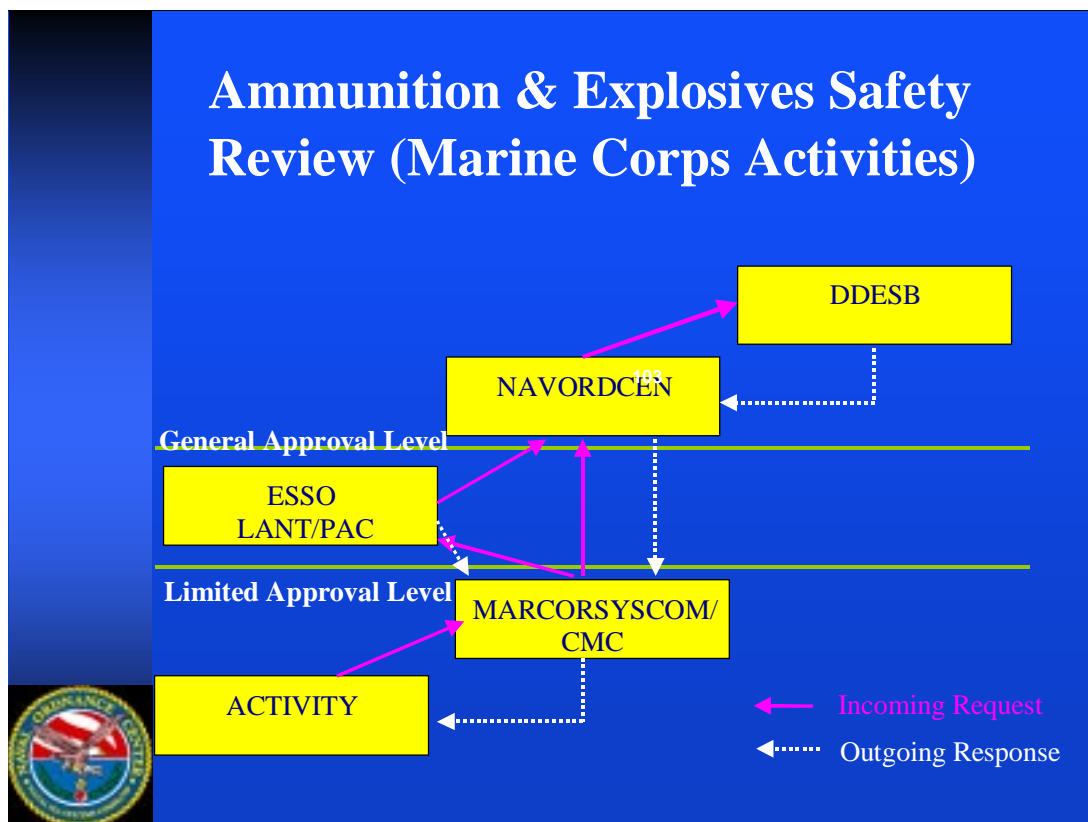


Figure 6. Marine Corps Site Approval Process

## Waiver and Exemption Process

DoD 6055.9-STD permits the military services to grant waivers, exemptions or secretarial certifications, based on operational requirements, but requires that these authorizations be reviewed on a periodic basis. OPNAV Instruction 8023.20E, Waivers of and Exemptions from Explosives Safety Requirements, provides DON policies and procedures for requesting waivers, exemptions, and secretarial certifications. This instruction also establishes a Navy-unique waiver called an “event waiver”.

When explosives safety criteria cannot be met, but there is compelling operational requirements to conduct explosives operations, these operations can be permitted within the DON, after formal, written approval of a deviation, or departure, from the established explosives safety standard. For the Navy and Marine Corps, these deviations are approved by CNO, as delegated by SECNAV Instruction 8020.3C. For explosives safety applications, a deviation authorized by CNO is considered to be a departure from Navy or DoD criteria, but under strictly controlled and regulated conditions, based upon compelling operational need. Deviations that may be authorized by appropriate authority within the DON are as follows:

**Event Waivers.** These are deviations approved on a case-by-case basis for a particular evolution, and issued for a limited period to meet a specific, non-recurring readiness or operational requirement which cannot otherwise be satisfied. Event waiver approval authority was delegated by CNO in 1995 to Commander in Chief, U.S. Atlantic Fleet (CINCLANTFLT), Commander in Chief, U.S. Pacific Fleet (CINCPACFLT), Commander, U.S. Naval Forces Europe, Commander, U.S. Naval Forces, Central Command, and Commander, Marine Corps Systems Command. For all other Navy commands, CNO remains the approving authority for event waivers.

**Waivers.** These deviations from mandatory explosives safety requirements are approved, for the purpose of temporary satisfaction of recurring readiness or operational requirements, and are issued pending the completion of corrective measures to eliminate the requirement for waiver.

Waivers are issued for a 2-year period and may be renewed by CNO, upon a detailed review and evaluation by the AMHAZ Board.

**Exemptions.** These deviations from mandatory explosives safety requirements are approved for the purpose of long-term satisfaction of recurring readiness or operational requirements. Except in certain cases where authorization to purchase real estate for sufficient ESQD clearances has not been granted, where it is in the best interest of the United States to grant agricultural leases of encumbered land, or where significant impairment of the defense posture of the United States would result, a positive program for eventual correction of the deficiency must be planned and in the process of being carried out. Exemptions are issued for a period of 5 years and may be renewed by CNO, upon a detailed review and evaluation by the AMHAZ Board.

All CNO-approved deviations to explosives safety criteria are based on operational necessity. Operational necessity is defined as a situation of such compelling urgency that failure to grant a deviation from established explosives safety criteria will have a deleterious impact on the mission readiness of naval forces. Operational necessity is certified to CNO by the Fleet Commander, Type Commander, or other appropriate Echelon-2 commanders.

When a facilities site request has been reviewed by the DDESB and not approved for construction, because of non-compliance with explosives safety criteria, and, for operational reasons, the facility must be built, CNO must obtain a certification from the Secretary of the Navy authorizing construction. This type of deviation is referred to as a “Secretarial Certification”. Prior to submission to the Secretary of the Navy, each of the available alternatives must be fully considered and evaluated. If none of the alternatives achieve the desired end result, and no other site exists where the facility can be built to meet explosives safety criteria, CNO will prepare a memorandum to the Secretary of the Navy. This memorandum must provide complete background on, and full details, concerning the proposed facility. OPNAV instruction 8020.8J provides the procedures for obtaining a secretarial certification. Currently within the DON, six secretarial certifications have been approved. Figure 7 provides a diagram on the waiver and exemption approval process.

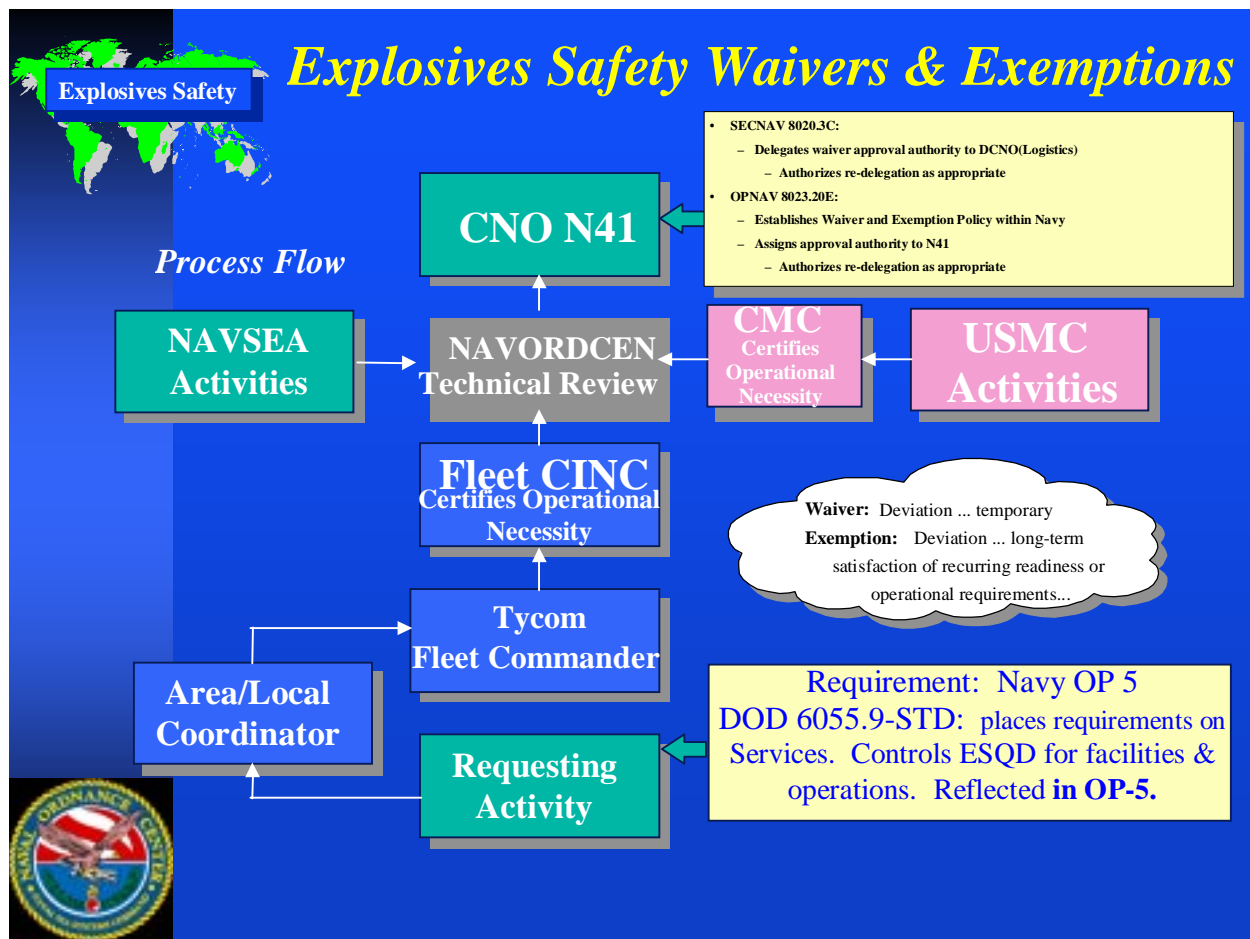


Figure 7. Waiver & Exemption Site Approval Process

The Navy has established an investment strategy to reduce the number of correctable waivers and exemptions by 50 percent by the start of CY 2000, using 1995 as the base year. In 1995, the Navy had 180 waivers and exemptions in effect. Not all of these deviations, however, were feasible to correct. When looking at those deviations that were feasible to correct and reducing this number by 50 percent, the Navy established a target goal of 125 waiver and deviations for CY 2000. As of 1 July 1998, the Navy has exceeded its goal and currently has only 114 waivers and exemptions in effect. The Marine Corps currently has 18 waivers or exemptions in effect.

## Enforcement

### Explosives Safety Surveys, Reviews and Inspections

The DON uses the “Triple Crown” approach to conducting oversight of the Explosives Safety Program. The three levels are:

1. Department of Defense Explosives Safety Board (DDESB) surveys
2. Ammunition and Hazardous Materials (AMHAZ) Handling Review Boards
3. Explosives Safety Inspections (ESI)

The review and inspection process is designed to focus on reducing the probability of a mishap and to inform ordnance workers with regard to what constitutes an acceptable risk when working with ammunition and explosives.

DDESB surveys, AMHAZ Board reviews, and ESIs are all used to assist the activity in identifying hazards and to improve their local explosives safety program. The following information is provided to clarify the functions of these three distinctly different efforts and how each effort complements the other and helps to ensure a safe ordnance environment.

#### 1. Department of Defense Explosives Safety Board (DDESB) Surveys

The DDESB was established by an act of Congress in 1927 and sets explosives safety policy for all DoD components. OP 5, vol. 1, paragraph 1-3, provides additional information on the DDESB. Some of the responsibilities the DDESB is charged with include:

- a. Surveying, studying and evaluating activities, to determine compliance with DoD ammunition and explosives safety standards, and detecting conditions that could result in loss of life or damage to property.

b. Reviewing and approving all general site plans, for construction or modification of ammunition and explosives facilities and sites.

c. Preparing programs of investigation, research, study and tests, concerning ammunition and explosives hazards that are required to develop and maintain safety standards.

d. Executing the portions of these programs that are approved by the Office of the Secretary of Defense.

The DDESB conducts surveys of each DoD activity that handles, stores, or manufactures ammunition or explosives. These surveys are primarily focused on assessing an activity's compliance with DoD explosives safety criteria. In addition, they serve as a method of evaluating the Department of the Navy's explosives safety site approval process. The DDESB survey criteria is contained in DoD 6055.9-STD. Supplementary instructions for Navy and Marine Corps activities were prepared, using the DoD criteria as a basis, and incorporated into OP 5 by NAVORDCEN for all shore installations. The DDESB, however, uses OP 5 when conducting their reviews of Navy and Marine Corps activities.

## 2. The Ammunition and Hazardous Materials (AMHAZ) Handling Review Board

The second phase of our “Triple Crown” approach is the AMHAZ Review Board. The AMHAZ Board is a CNO-sponsored review of how activities are interpreting and implementing explosives safety requirements. OPNAVINST 8023.13 provides the procedures for conducting AMHAZ Review Boards. The Board is comprised of senior officials from within the Department of Navy (DON) who have responsibility for explosives safety, including developing and issuing OP 5, OP 4, and other explosives safety publications. This Board focuses on all factors pertinent to proper safety in the handling, storage and transportation of ammunition and explosives. Primary functions of the Board include evaluating existing or proposed waivers/exemptions of explosives safety criteria, making recommendations to CNO (N41) on their validity, and the review of all planned construction affected by this criteria. The AMHAZ Board is an advisory group, not an inspection, dedicated to

working with commands to achieve the best balance between operational readiness and proper safety within economic constraints.

### 3. Explosive Safety Inspections (ESI)

The third phase of our “Triple Crown” approach is the conduct of Explosives Safety Inspections (ESI), both afloat and ashore. These are the true inspections and, for shore activities, are evaluated as satisfactory or unsatisfactory, per NAVSEAINST 8020.14A, Shore Station Explosives Safety Inspections. NAVSEAINST 8023.12, Explosives Safety Inspections Afloat, provides detailed guidance on the conduct of explosives safety inspections aboard Navy ships.

NAVORDCEN (N71) serves as the office of primary responsibility for all explosives safety matters affecting the ESI program for Navy and Marine Corps shore activities and all Navy ships. This office is also responsible for monitoring and evaluating the effectiveness of each activity's overall explosives safety program.

The DON ESI Program, as we now know it, evolved from a one-man office established in 1962. Since its inception, the ESI process has undergone continuous change. Organizationally, the inspection function always had its ties with COMNAVSEASYSCOM but changed hands, operationally/administratively, from a variety of Navy commands, to its current placement within the Naval Ordnance Center as the Explosives Safety Support Office, Atlantic and Pacific (ESSOLANT/PAC). These offices are physically located in Norfolk and San Diego, respectively.

The ESSOs have the assigned responsibilities for conducting explosives safety inspections and providing on-site assistance to all Navy and Marine Corps shore activities and ships, as requested. Activities are inspected for compliance with NAVSEA OP 5 vol. 1 and other relevant Naval, DoD, and Federal rules and regulations. NAVSEAINST 8020.14A and 8023.12 provide an inspection checklist for the conduct of explosives safety inspections ashore and afloat, respectively. These checklists can be used by individual commands, when conducting a self-evaluation on their compliance with explosives safety criteria. Self-evaluations are required by both NAVSEAINST 8020.14A for shore activities and by NAVSEAINST 8023.12 for ships.



Originally chartered to inspect explosives safety ashore, the program was expanded in 1967 to inspect ships, and, for a period (1978-1983), the ESI process included Arms, Ammunition and Explosives (AA&E) physical security inspections aboard ships and ashore. Additional responsibilities to identify explosives safety design deficiencies aboard ship were added around 1978. Throughout, the approach to explosives safety inspections has changed, too. Eventually, the current 15-point ashore program evaluation guide and 11-point shipboard program evaluation guide were adopted, and an objective, reference-verifiable listing of deficiencies and discrepancies now forms the basis of the inspection. The inspection is commonly referred to as a "black-hat" inspection, and although activities use the inspectors to their advantage to gain knowledge and assistance, there is never any doubt that the ESI is a "pass/fail" evolution. Figure 8 provides a chart on the number of shore activities inspected and those that received unsatisfactory ratings.

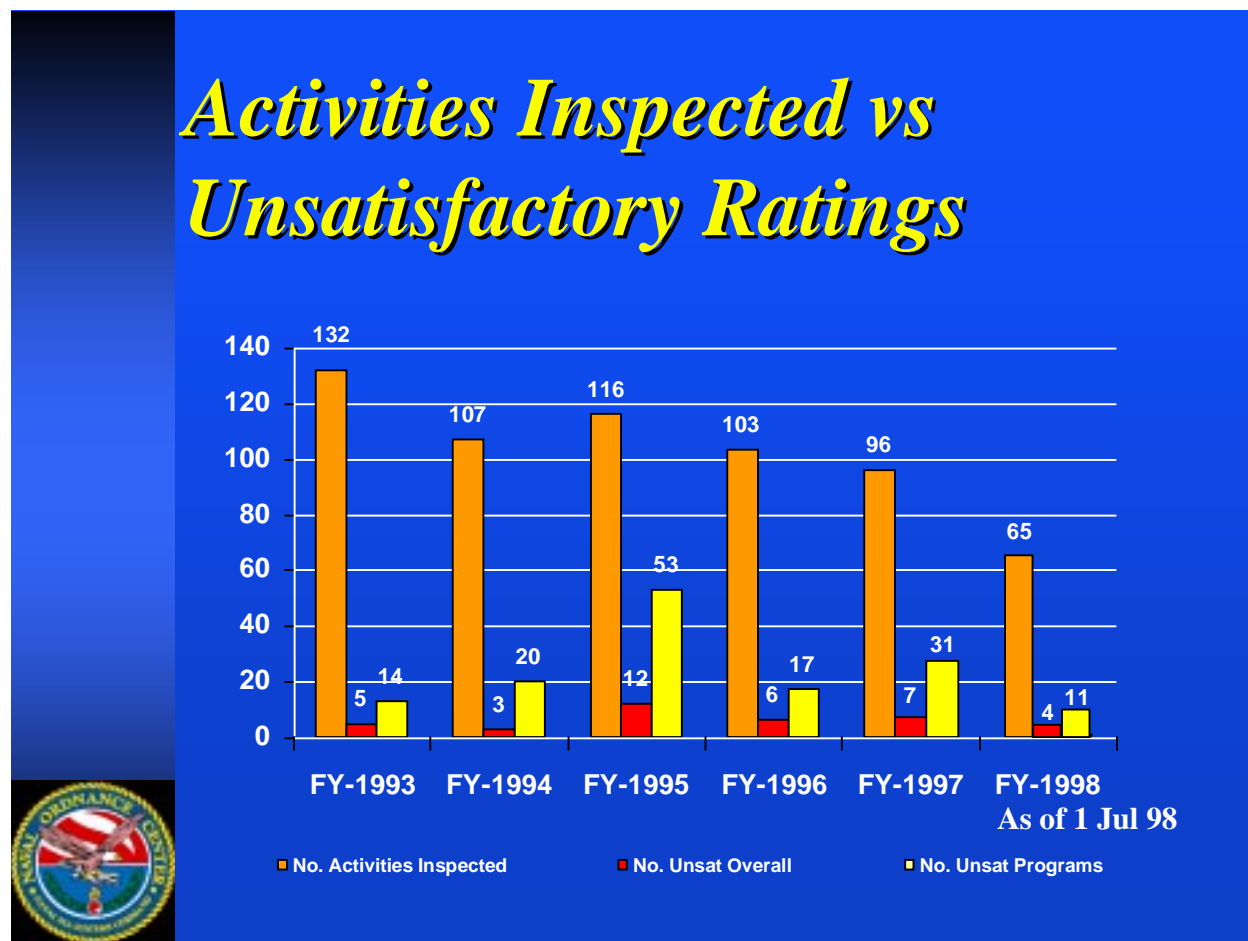


Figure 8. Activities Inspected Vs Unsatisfactory Ratings

The ESI process was strengthened in 1989, with the addition of a chief inspector to the composition of the team. It was felt that an ordnance-experienced naval officer, of the rank of captain (O-6) or commander (O-5), would strengthen the "credentials" of the inspection, inasmuch as there was a perception that the shore explosives safety inspection was not being received as a serious and important inspection by some of its recipients. Originally, the chief inspectors were the commanding officers of Naval Weapons Stations and Navy Ordnance Research and Development Facilities. As time progressed, it was apparent that the demands of the inspection program were exceeding the time commanding officers had to spend on this collateral duty, and a new approach, using qualified naval reserve captains, was adopted. The formation of NAVSEA Reserve Detachment 1806 in 1993 (now called Naval Reserve NAVORDCEN HQ 106), plus the use of other selected Navy and Marine Corps officers, has subsequently eased the burden borne by ordnance commanding officers.

The ESI process provides the local commanding officer, and also headquarters-level explosives safety program management personnel, with a feedback mechanism on how the explosives safety program is functioning at the individual command level. Data collected and compiled from an ESI provides feedback for commanding officers on compliance with standards and serve as a means of providing "deckplate" level education and training to those personnel who are handling ammunition and explosives. The data also provides feedback to program management personnel, in their efforts to monitor the effectiveness of the overall safety program, identify problems, and provide trend analysis.

Navy and Marine Corps facilities ashore are inspected at intervals ranging from 12 to 36 months, based on their level of involvement with Ammunition and Explosives (A&E). Facilities that are engaged in production of ammunition and explosives, including handling and storage, are inspected every 12 months, as "category I." Facilities performing assembly and disassembly of ordnance, including handling and storage, are inspected every 18 months (category II). Facilities that do primarily handling and storage, with minimal assembly and disassembly, are inspected every 24 months (category III), and facilities that deal with small quantities of class 1.3 or 1.4 A&E are inspected every 36 months (category IV). Ships are inspected every two years, as scheduled by the Fleet Commander.

The makeup of an ESI team varies, according to the size of the activity to be inspected and the complexity of its operations. In addition to the cadre of regularly assigned inspectors, ESI teams may include professional personnel specializing in A&E handling, A&E science and engineering, inventory control, and environmental control and hazardous waste management. As previously mentioned, a military officer of senior rank serves as the chief inspector for ESIs conducted at field activities having larger scale operations. Chief inspectors are selected by NAVORDCEN, with major claimant concurrence.

NAVORDCEN ESSOLANT is responsible for all shore activities east of the Mississippi River, including Gulf Coast activities, and those in the Atlantic and Mediterranean Ocean regions, including the North Atlantic Treaty Organizations countries, and all ships under CINCLANTFLT claimants. NAVORDCEN ESSOPAC includes all shore activities west of the Mississippi River, including applicable Gulf Coast activities, and activities in the Pacific Ocean and Persian Gulf regions, and all ships under CINCPACFLT claimants. Each division is responsible for the training and certification of their inspectors and for assigning a team leader.

At the start of an inspection, an in-brief is conducted with the commanding officer, executive officer, and other ordnance department and safety department personnel. Following the in-brief, the ESI team discusses the itinerary for the week with the command, divides into subgroups, and assigns specific areas of programs for each group to inspect. The group reviewing Standard Operating Procedures (SOPs) includes checking to see if all the elements are addressed and to ensure that they are being used effectively in the field. Qualification and Certification (Qual/Cert) programs are checked for documentation accuracy and to determine if personnel are actually receiving the required training. Inspectors also exercise the option to talk to employees, to obtain information and to get a feel for their personal interest in the job and their level of knowledge in the duties they are performing.

Each of these enforcement efforts is complementary and serves a distinct purpose in the over-all DON Explosives Safety Program. They have been established to assist each organization where

ammunition or explosives is manufactured, handled, or stored, in maintaining a safe ordnance environment.

## Education

### Explosives Safety Training

The Navy Explosives Safety School was established in 1967 by the Naval Ordnance Systems Command, currently called the Naval Sea Systems Command, at the Naval Weapons Support Center, Crane, IN, which is now called the Naval Surface Warfare Center, Crane Division. This school was subsequently moved to Bloomington, IN, in cooperation with Indiana University, to meet the expanding need for occupational safety and health training, as well as explosives hazard control training, within the DON. In 1988, the Defense Ammunition Center (DAC) Savanna, IL, was tasked to teach the explosives safety-related courses formerly taught at Bloomington. At this same time, the remainder of the Navy Safety School was moved from Bloomington to Norfolk, VA, and now focuses on occupational safety and health courses.

To satisfy the ordnance community's needs, mandatory and recommended courses were incorporated into NAVSEA OP 5 in 1993, as the Explosives Safety Training Program, Appendix D, for personnel with daily responsibilities for ammunition and explosives. Currently, the 11 courses maintained for DON personnel (see detailed list and matrix below) can be categorized as: Basics of explosives safety for workers, supervisors, top-level management and logistics personnel; conveyance licensing and inspection; lightning/grounding; and explosives facility siting. To maintain maximum flexibility for the students, training is conducted at the DAC schoolhouse in McAlester, OK, or on-site at the local command with DAC instructors. Approximately 60 explosives safety courses are taught annually by DAC for the Navy, with 85% taught on-site. Training is also available through "training-the-trainer" programs and on CDROM. Future efforts are directed towards converting additional applicable courses to CDROM over the next few years. During the period FY93 through FY97, approximately 6500 Navy and Marine Corps students have attended Navy explosives safety courses offered through DAC and sponsored by NAVORDCEN. Figure 9 provides a matrix, taken directly from OP 5

Appendix D, of the courses that are mandatory and recommended by NAVSEA OP 5. Following is a brief description of each of the courses taught by DAC for the Navy.

<b>Positions</b> (Based on actual duties performed, not job title)	<b>Navy Explosives Safety Courses</b> (Details on course availability, length, equivalency, etc. are listed in paragraphs D-3a through D-3k and should be consulted before attending.)										
<i>M = Mandatory</i> <i>R = Strongly Recommended</i>	Explosives Safety and Environmental Risk Management	Basic Exp. Safety	Elec. Exp. Safety for Naval Facility	Naval Motor Vehicle & Railcar Insp.	Naval Motor Vehicle & Railcar Insp. Recert.	Expl. Stty. for Naval Facility Planning	MHE Operator	Expl. Haz- ardous Materials Driver	Explosives Safety Standdown	EOM	Local Instructor
Commanding Officer, Officer-in-Charge, Executive Officer, the Senior Civilian Director	M								R	M	
Ordnance/Weapons Officer						R			R	M	
Explosives Safety Director/Officer (oversees operations at facilities, enforces all safety regulations)		M	R			R			R	R	
NAVORDCEN Explosive Safety Inspectors		M	M	R		M			R		
Explosives Safety Specialist (monitors programs and operations on site)		M	R	R		R			R		
Local Instructor		M	M				M	M	R		M
Personnel who conduct or inspect grounding, bonding, and/or lightning protection		R	M						R		
Personnel who prepare site approval requests		R				R			R		
Personnel who review site approval requests for release		R				M			R		
Personnel required by OPNAVINST 8023.2 (series) to be qualified and certified to handle ordnance and explosives, i.e., ordnance worker		M							R		
Inspectors of explosives laden vehicles required to sign forms (DD 626 &/or 836)				M	M				R		
Explosives MHE Operator		M					M		R		
Explosives/Hazardous Materials Driver								M	R		

Figure 9. Matrix of Mandatory Courses

Basics of Naval Explosives Hazard Control – Provides basic understanding of the hazards of ammunition and explosives, and reviews the explosives safety principles. \*(36 hours/AMMO-C-21)

Explosives Safety for Officers/Managers/Supervisors – Provides safety indoctrination for managers with responsibility for the safety of ammunition and explosives. \*(36 hours/AMMO-C-25)

Laboratory Explosives Safety Course – Provides laboratory personnel with a basic understanding of the hazards of ammunition and explosives, and reviews the explosives safety principles in OP 5. (24 hours/AMMO-C-26)

\* AMMO-C-21 and AMMO-C-25 courses are combined on one CDROM to facilitate local training.

Electrical Explosives Safety for Naval Facility - Provides specialized safety training in inspection, testing, documentation, and other electrical safety aspects applying to explosives facilities \*(28 hours/ AMMO-C-27) (CDROM planned)

Explosives Safety for Naval Facility Planning - Provides specialized safety training in preparation and review of site plans and releasing site approval requests (36 hours/AMMO-C-15) (CDROM planned)

Expendable Ordnance Management Course - The EOM course provides a professional safety foundation in areas of ammunition maintenance, demilitarization, storage, supply and inventory (160 hours/ AMMO-L-21)

Explosives Safety and Environmental Risk Management Course - Provides senior officers and civilians an overview of their explosives safety and environmental responsibilities (16 hours/AMMO-L-24 and video)

Material Handling Equipment Operator Course - Provides training to license forklift operators to handle ammunition and explosives – (40 hours)

Naval Motor Vehicle and Railcar Inspection Course - Provides training for physical inspection of conveyances and blocking, bracing, labeling, marking and placarding of shipments (40 hours/AMMO-L-22)

Explosives Hazardous Material Driver Course - Provides general awareness and training for personnel engaged in the transportation of ammunition, explosives and dangerous articles (AEDA)/hazardous materials (HAZMAT) on station and over public highways (12 hours)

Technical Transportation of Hazardous Materials - Provides personnel of all services detailed technical information pertaining to all phases of transportation of hazardous materials. Course content includes emphasis on international and DOT regulations covering transportation of hazardous materials by all modes. It includes United Nations Performance Oriented Packaging (UN POP) marking, labeling and hazard communications requirements. Compatibility of hazardous materials during transportation and physical security of AA&E are emphasized (80 hours/AMMO-L-17)

Explosives Safety Standdowns - Recommend activities conduct a yearly explosives safety standdown as part of an overall proactive explosives safety program.

## Explosives Safety Mishaps

Although the DON has established a comprehensive explosives safety program, the program is not perfect and we have mishaps. The vast majority are minor in nature, for example, the initiation of a cartridge activated device (CAD) during maintenance on aircraft systems. While there are numerous ways to analyze mishap data, one metric that we routinely monitor is personnel error rates. As the DON downsizes to meet current operational requirements, monitoring personnel error rates may be an indicator regarding the need for additional training or an increase in the number of personnel assigned to perform an ordnance task. Figure10 provides mishap data over the past five years and the number of mishaps that resulted due to personnel error.

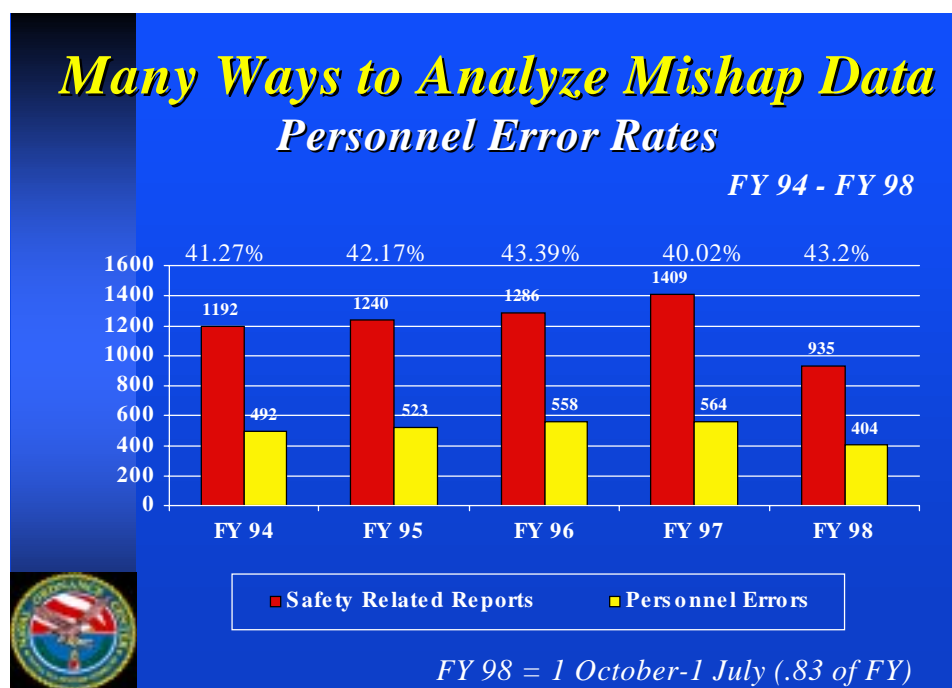


Figure 10. Personnel Error Rates

## Strategic Plan For Explosives Safety

In May 1997, the Secretary of the Navy approved a Strategic Plan for the Department of the Navy Explosives and Weapons Systems Safety Program. This strategic plan is designed to further enhance the DON Explosives Safety Program over the next five years. Six explosives safety strategies were identified, and working groups were established to implement the goals and objectives. The six strategies are:

1. Authority and Responsibility
2. Education and Training
3. Technology
4. Measurability and risk assessment
5. Communication
6. Documentation



In addition, an Executive Steering Council was established to provide direction and guidance to, and monitor the progress of, the working groups.

## Summary

The DON has implemented a comprehensive Explosives Safety Program consisting of several pieces or elements. Just as each piece of a puzzle provides only a small portion of what the overall picture will look like, similarly, each piece of the Navy's Explosives Safety Risk Management Program, when viewed separately, only provides a limited view of this comprehensive program. When all pieces are viewed together, however, they form a complete picture of the Navy's total Explosives Safety Risk Management Program. No one element of the program is more important than any other element. Each element supports and complements the others, to ensure a safe ordnance environment, both afloat and ashore, throughout the weapons lifecycle.